INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Review Paper on Automatic Gain Controlling of FO-PID using MFO

Samreen Tabassun MIR[1], Er. Vikas Sharma[2]

[1]*Electrical Engineering Department of E-max Group of Institutions, Kurukshetra University, Kurukshetra.*

[2]*Associate Professor, Electrical Engineering Department of E-max Group of Institutions, Kurukshetra University, Kurukshetra.*

Abstract: In a micro grid the FOPID controller is utilized for steadiness investigation and compensation of reactive power. The FOPID controller has two extra parameters more than PID controller that makes two degree of freedom in controller design and application. This study proposed a novel approach for FOPID system. The innovation is done in proposed work by implementing the Moth Flame Optimization with Fuzzy based PID controller to optimize the results. The proposed work is implemented in MATLAB and for the purpose of evaluation the analysis is done by considering Cuckoo search and proposed work. On the basis of the analysis, it is derived that the accuracy of MFO algorithm is higher than Cuckoo search algorithm. MFO algorithm has good robustness, fast convergence speed and global optimization in comparison to other optimization algorithms that makes it more effective and reliable than other optimization techniques.

Keywords: FOPID, Hydrothermal, Electric governor, Gas power system, MFO.

I. INTRODUCTION

Keeping the frequency and voltage in the nominal value or in predetermined restriction are the key significant problems in the power mechanism operation and protection.

The reliability and quality of generation power depend on balance between the power generated and power demand plus power losses in all over the power system. In the frequency and tie-line power deviation is occurred as this balance is disrupted. Hence using a proper control method it is necessary to prevent the power system to go to an unstable state. So far, different control method has been used to control the power system frequency in various type of power system. Until now, some review articles in the LFC issue have been published. For load frequency control of two-area power mechanism the fuzzy PID type controller has been examined.

At the power creation in the occurrence of the GRC a two-degree-offreedom PID load frequency controller is presented. On the basis of the maximum peak of response particularization for Automatic Generation Control (AGC) in multi-machine power mechanism the vigorous PID controller is tuned. By applying Neuro Fuzzy Inference System (ANFIS) and Artificial Neural Network (ANN) on the basis of Genetic Algorithm (GA) for LFC issue an adaptive PID has been tuned. Presently, an enhanced edition of PID controller named as FOPID controller have been utilized by several researchers at the several research studies. For Automatic Generation Regulator by applying CNC-ABC paradigm the FOPID controller parameters has been optimized. In a micro grid the FOPID controller is utilized for steadiness investigation and compensation of reactive power.

The FOPID controller has two extra parameters more than PID controller that makes two degree of freedom in controller design and application.

Thus, to load frequency control of a couple of domain multi-source interconnected power system by taking into an account the GRC and the Flexible Alternating Current Transmission System (FACTS) appliances like SMES the FOPID controller has been utilized. On the basis of the established balanced within the power produced and required among the power losses the generation power quality and flexibility was predictable in the whole power system [1]. There is some deviation caused in power and frequency because of disruption in balance.

Some random change in the loads can also be seen due to this disruption. This is the reason, it is recommended to use the proper control method so that overall constancy of power unit can be obtained.

Till the time numerous control method exist and used to control the frequency parameter in different power systems [2].

II. LITERATURE REVIEW

1) *Yamashita Akira et al. [2016], [29]* In the beginning, P2P multiple dimensional searching design had been projected that can be effectively used by the consumers to determine the good suppliers in accordance with the multiple dimensional situation. This paper had projected the enhanced version of searching network in which the number of calculations was reduced in order to locate the supplier. After analysis the results had shown that projected technique can efficiently minimize the number of calculations.

2) *Arzani Ali et al. [2016], [2]* various recently conducted experiments had shown that the improved operation of Power Electronic Interfaces can be attained by effective tuning of its various controlling factors. Consider an example, in present scenario the DC sources linked with the power units through voltage source converters. For optimum performance of grid the PV inverter has been evolved as crucial and mostly used device. In ordinary PEI tuning technique there were various numbers of disadvantages like complex structure, high cost, and probable inadequacy. In this paper, automatic tuning method had been projected. In this technique the methods are derived from particle swarm optimization algorithm. Two specific areas were linked with multiple mega watts solar Photovoltaic plant. The propose system was analyzed by using the real time digital simulator. The projected tuning method is effective it was proved by the optimum operation of solar Photo Voltaic unit in integration with enhanced steady state and varying performance of PV-VSI inverters. This had reduced carbon emission, enables renewable energy sources utilization, optimum transmission of power with reduced cost.

3) *Stativa Andrei et al. [2012], [25]* replaces the traditional power system by the optimal tuning and PSS by using the PSO paradigm. The anticipated system was designed in MATLAB software. The operation of projected unit was more efficient as compare to conventional systems and it was concluded from the simulation results.

4) *Mehta M.Ankur et al. [2014], [15]* in this work the script based environment for the development that allow the users in order to simply construct and develop mechanical parts for folded robots made up of plastic. The technique used for construction was not costly and easily available; the equipments created while executing this technique permit to share the open source design. The obtained design was integrated with different components with the help of various techniques to generate the first building blocks so that in the end the flexible robot can be obtained. This method was implemented to construct different parts of robots that can freely move. This had increased the complexity but on the other hand it also increased the degree of free robot. The method that had been proposed in this paper was effective, can help in various further researches in this field and can lead to absolute compiler of robot.

5) *Palmintier Bryan et al. [2017], [19]* this paper had introduced the concept of integrated grid modeling unit (IGMS). IGMS can be described as a new framework for modeling the electrical system used for the broadcast of the integrated delivery investigation which simulated the offshelf tool on the basis of efficient operation calculation platform that offers the unprecedented resolution obtained from the ISO market down for the appliances and the other uses at the end. Certainly, the system works on the hundreds and thousands of models working on distribution system for the simultaneous simulation with the ISO market as well as the AGC level for the deployment was reserved. In this work, tool of IGMS system along with its operation and effects on multiple simulation was described and analyzed for the high-penetration solar PV and the load scenario on the basis of the price response.

6) *M Deepak. [2014], [18]* this paper had presented the synchronized management of the SMES system in Automatic Generation Controller of linked two regions with multiple source power production units. After unexpected variation in load, the performance of the system AGC can be transformed into effective operation by implementing the projected technique. By regulating the quadratic operation index and b implementing the ISE method, it was possible to obtain the integral form of gain of Automatic Generation Controller. The analysis in time domain can be done on two regions multiple units multiple sources power unit. After simulation it was observed that the SMES can eliminate the variations in specific area frequencies and transmission in tie-line power with optimum transient operation. It also helped in achieving the rapid settling time and any external power device was not required.

7) *Karray F. et al. [2002], [9]* presented that this soft computing based PID controllers are designed to improve the conventional controllers. The hierarchical tuning is used for controlling the control loop of the non-linear systems. The basic need of the system is to meet the increasing need of the industries for such a highly reliable and efficient system is designed .so in this the flexible calculating methods were used to improve the efficiency of operation in conventional controllers. The designed controller have modified features of learning that would enhance the performance and stability of structure too .Finally, results is calculated that is compared with the PID controller that shows that the proposed controllers is much efficient than the traditional controller.

8) *Venayagamoorthy K. Ganesh et al. [2014], [28]* in this paper the author had illustrated that the integrating variable creation sources like utility-scale photovoltaic (PV) plants into the transmission grid was attractive among the enhancing quest for cleaner sources of electric power creation and decreasing expense of utility-scale PV. Typical results to illustrate the proposed real-time tie line bias control are presented on a 2- regions 4 machine power unit with utility-scale PV plant. Moreover, for several levels of PV power penetration were carried out and the occurrence of low frequency modes were pointed out, an analysis of the tie-line power oscillations because of cloud cover and disturbances.

III. PROPOSED WORK

As the power electronics is utilized broadly and becoming necessary in the energy alteration mechanism, the errors of these backbone dc–ac converters may conclude in critical issues and expense. In several applications it is turned into a requirement that the power converters must be flexible to survive some errors to assure specific accessibility of the energy supply.

Conventional resolutions to overcome these issues are exactly choosing and managing the positive- and negative-sequence currents. A novel series of control strategies that use the zero sequence components was applied to improve the power control capacity under this difficult situation. As the biggest demerit of this zero sequence current control simulink model was that it generates Total harmonic distortion (THD). So, in this paper the author had modify the existing mechanism that is a zero sequence current control simulink model in order to remove the Total Harmonic Distortion by using multi-level inverters and introduce the filter in the control circuit. The Pulse Width Modulation is also utilized in the present work for the power conversion and also to control the power.

IV. METHODOLOGY

The Figure 2 illustrates the block diagram of the projected mechanism. Here the methodology of the projected mechanism is discussed below as:

A. Power System

The three power methods that are hydrothermal power method, Electric Power method and Gas thermal power method has been taken for the projected mechanism. The major aim of these mechanisms is to decrease the issue of overshoot in the mechanism. The method produces unwanted outcome among the high utilization of cost because of the issue of the overshoot. Therefore, in the next section three mechanisms are taken on which tuning has done.

B. PID Controller

A PID controller has characteristics of each controller such as it has the characteristics of proportional controller along with the characteristics of Integral controller and finally contains the characteristics of Derivative controller. The rise time of the system can be minimized by Proportional Controller and also it helps in reduction in error in steady state but it is not able to achieve it completely. Now in integral controller the steady state error can be removed completely and also resulted in bad transient response. On the other hand, the derivative controller makes the system stable along with reduction in overshoot. Thus, every power system has tuned using the PID controller as it reduces the problem of overshoot in the system and produces the desired output.

Applied Proportional Integral Derivative controller's transfer function is given below:

$$K_p\left(1 + \tau_d s + \frac{1}{\tau_i s}\right)..................... (1)$$

C. Optimization Using Mfo

After tuning individual power system using PID controller, the hybrid values from each power system has acquired. Once the tuning has done optimization by MFO algorithm is performed.
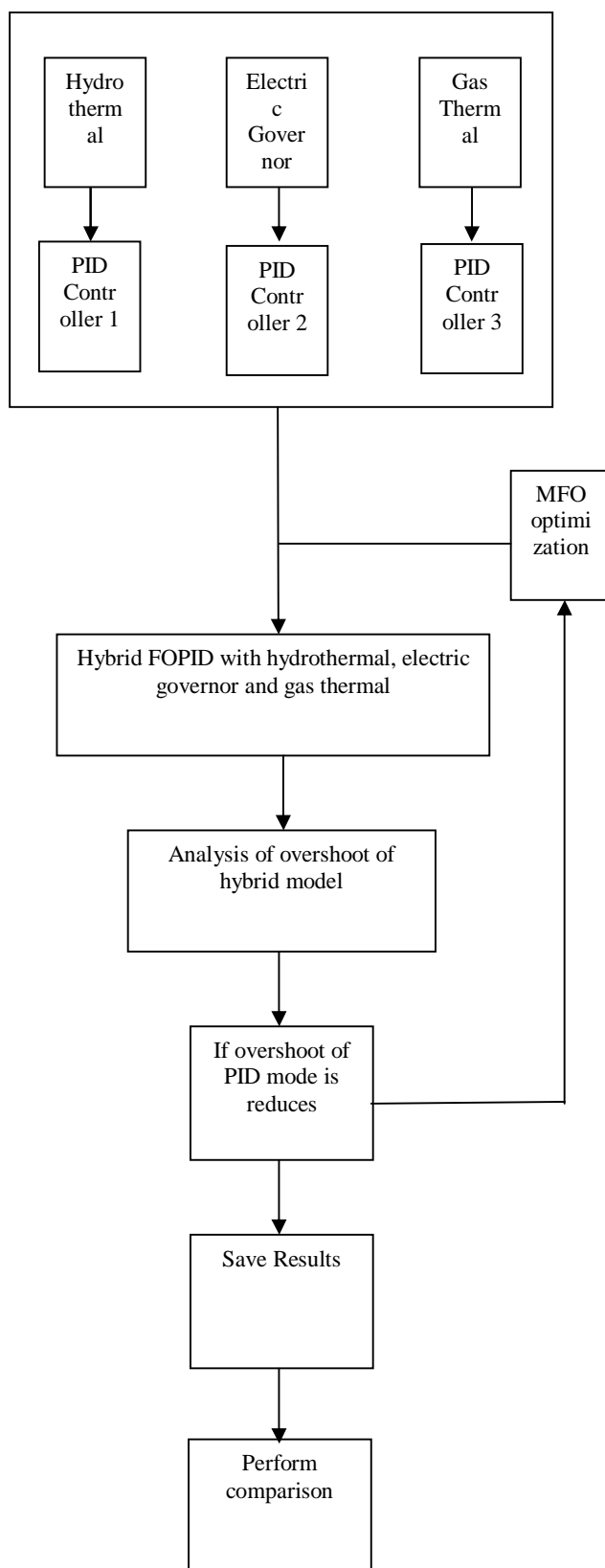
Figure 2 Block Diagram of proposed work

D. Hybridization

Once the optimization has done to select the optimum parameters, next the acquired output will be the hybrid FOPID which have three different power systems such as hydrothermal power system, Electric Power system and Gas thermal power system. The idea behind their hybridization is the analysis of problem of overshoot in the hybrid system.

E. Analysis of Overshoot

The combined model is then analyzed to detect the effect of overshoot in the system. The hybrid model is then examined in terms of how far it is stable and efficient. Now checks if the problem of overshoot has reduced, in that case, saves the results but if the effect of Overshoot has not reduced yet then again perform optimization algorithm over the acquired output to reduce the effect of overshoot in the hybrid system. The process will be continued until the desired output is not produced or the number of variations (overshoot) is not accordingly.

F. Perform Comparison

Lastly, the output acquired from each power system with MFO optimization has showed. Thus, each power system output is compared with the individual optimization algorithm to confirm the stability of the system. From the results, it has observed the MFO optimization paradigm is efficient than CSA when the tuning of PID controller has been analyzed.

Once the optimization has done to select the optimum parameters, next the acquired output will be the hybrid FOPID which have three different power systems such as hydrothermal power system, Electric Power system and Gas thermal power system. The idea behind their hybridization is the analysis of problem of overshoot in the hybrid system

REFERENCES

[1] Abdul-ghaffar I.H.,Ebrahim. A. E. and Azzam A., "Design of PID Controller for Power System Stabilization Using Hybrid Particle Swarm-Bacteria Foraging Optimization" WSEAS transactions on power systems, Issue 1, Volume 8, Pp 12-23, ,January 2013.

[2] Arzani Ali, Arunagirinathan Paranietharan, Jayawardene, Iroshani and Venayagamoorthy, K.Ganesh,"Dynamic Performance Enhancement of a Utility-Scale Solar PV Plant", IEEE, pp. 26 – 30, 2016.

[3] Bevrani Hassan,Daneshfar Fatemeh and HiyamaTakashi, "A New Intelligent Agent-Based AGC Design With Real-Time Application", IEEE, vol. 42, pp. 994 – 1002, 2012.

[4] DebbarmaSanjoySaikia ChandraLalit, SinhaNidul, Kar Biswajit andDattaAsim, "Fractional order two degree of freedom control for AGC of an interconnected multi-source power system", **IEEE, pp.**505–510, 2016.

[5] Debnath Kumar Manoj,Singh Bahadur Manjit and Mallick KumarRanjan, "Design of Optimal 2-DOF PID controller using GWO Technique for Automatic Generation control of a multisource Power System", IEEE, pp. 531 – 536, 2016.

[6] El-Metwall A.Khaled, "Power system stabilization using swarm tuned fuzzy controller" Proceedings of the 17th World Congress The International Federation of Automatic Control Seoul, Korea, July 6-11,Pp 11106-11111, 2008.

[7] Guolian HOU,ZhengXiaobin, Jiang Pengcheng and Zhang Jianhua, "Study of Modeling and Intelligent Control on AGC System with Wind Power", IEEE, pp. 4775 – 4780, 2014.

[8] Hiyama Takashi, Zuo Dunding and Funabashi T., "Multi-Agent Based Automatic Generation Control of Isolated Stand Alone Power System", IEEE, vol. 1, pp. 139 – 143, 2002.

[9] Karray F.,Gueaieb W. and Sharhan Al-S., "The Hierarchical Expert Tuning of PID Controllers Using Tools of Soft Computing" IEEE , Vol. 32, no.Pp 77 -87., February 2002 .

[10] Kawanishi Tetsuya,Inagaki Keizo, Kanno Atsushi and YamamotoNaokatsu, "Precise Measurement Techniques for Optical-to-electric Conversion", IEEE, pp. 3906 – 3906, 2016.

[11] Li Yuxiang, Zhao Yinliang and Shi Jiaqiang, "A Hybrid Samples Generation Approach in Speculative Multithreading", IEEE, pp. 35 – 41, 2016.

[12] Li Zhongwen, Zang Chuanzhi, Zeng Peng, Yu Haibin and Jing Bian, "Fully Distributed Optimal Automatic Generation Control for an Islanded Microgrids", IEEE, pp. 13 – 17, 2016.

[13] Mallick Kumar Ranjan, DebnathKumar Manoj, MallickKumarRanjan, SatapathyPriyambada, "Load frequency controller Design Using Hybrid Differential Evolution Particle swarm optimization (DEPSO) of an interconnected multi-source power system", IEEE, pp. 2629 – 2633, 2016.

[14] Mathur D.H.,Siguerdidjane H. and Bhateshvar K. Y., "Power Frequency Balance in Multi-Generation Smart Grid System with V2G option", IEEE, pp. 1 – 6, 2015.

[15] Mehta M.Ankur, and Rus Daniela, "An End-to-End System for Designing Mechanical Structures for Print-and-fold Robots", IEEE, pp. 1460 – 1465, 2014.

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)